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Europäisches Patentamt  
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(11) Publication number:

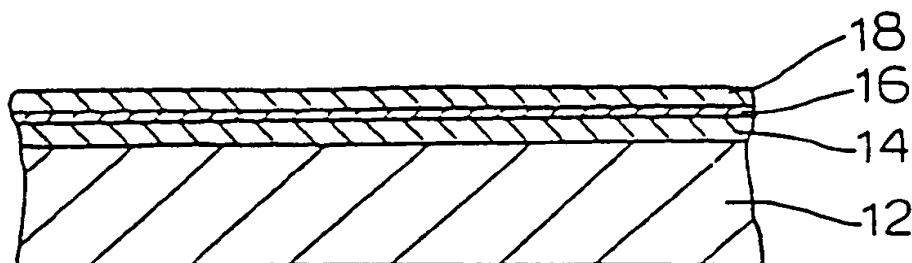
**0 635 582 A1**

(12)

**EUROPEAN PATENT APPLICATION**(21) Application number: **94111316.9**(51) Int. Cl.<sup>6</sup>: **C23C 14/20, A01K 87/00**(22) Date of filing: **20.07.94**(30) Priority: **23.07.93 JP 202918/93**  
**26.01.94 JP 23521/94**(43) Date of publication of application:  
**25.01.95 Bulletin 95/04**(84) Designated Contracting States:  
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**D-80538 München (DE)**(54) **Article having a decorative metal layer.**

(57) An article such as fishing tackle or the like, is provided with an exterior surface which has high strength so that any cracking or separation hardly occurs, has high durability, is light in weight and is decorated to have an aesthetically pleasing appear-

ance. The exterior surface is formed with synthetic resin coating layer, a thin decorative layer formed through physical vapor deposition with metal, and a transparent or semi-transparent protective layer.

**Fig.2****EP 0 635 582 A1**

## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention generally relates to a metal decorative layer. In particular, the present invention relates to a metal decorative layer for sporting goods including fishing rods, fishing reels, lures, tackle boxes, boats, golf club shafts, golf club heads, tennis rackets, badminton rackets, bicycle frames, and similar articles.

### Description of the Prior Art

As an example, Japanese Utility Model Unexamined Publication No. Sho-56-117680 discloses a fishing rod in which a carbon fiber layer is formed on the surface of a tubular body. A layer of chrome plating is formed on top of the carbon fiber layer so as to provide protection and a decorative, aesthetically pleasing appearance for the fishing rod.

Since the chrome plating layer directly contacts the carbon fiber layer, the chrome plated layer is prone to electric erosion which may cause the plating to become separated from the carbon fiber. Additionally, since the plating layer is comparatively thick, the weight of the rod is unnecessarily increased, and excessive stress such as that caused by bending of the rod during fishing, produces cracks. Further, since the carbon fiber layer generally presents an uneven surface, the plating layer is apt to also be uneven such that the decorative appearance of the plating layer is not aesthetically pleasing.

### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a decorative metal layer which: 1) has sufficient strength so as not to crack or separate from a contiguous adjacent layer, i.e. is durable; 2) is light in weight; and 3) is decorated with an aesthetically pleasing appearance.

Another objective of the present invention is to provide an article comprising a synthetic resin coating layer having a substantially smooth surface covering the exterior of the article, a thin decorative layer is formed on the synthetic resin coating layer by physical metal vapor deposition, and a transparent or semi-transparent protective layer is formed outside on the decorative layer.

Inasmuch as the synthetic resin coating layer is interposed between the surface of the article and the metal decorative layer, it is possible to prevent the metal decorative layer from being electrically eroded, even if the article or the surface of the article is formed of carbon fibers or the like. Alternatively, the article itself can be formed of syn-

thetic resin with a substantially smooth, mirror-like surface.

The metal decorative layer can be formed by physical vapor deposition (PVD) such as vacuum deposition, sputtering, ion plating or the like. Consequently, the metal decorative layer is thinner in thickness and higher in impact resistance than that in the case of ordinary plating. Further, a PVD metal decorative layer is lighter in weight, resistant to separation or a cracking, and since the substrate to the decorative layer has a substantially smooth surface formed, no uneven portions are produced in this thin metal decorative layer. Additionally, a transparent or semi-transparent layer may be used to protect the thin metal decorative layer.

### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a side view of a fishing rod tube as an example of an article according to the present invention.

Figure 2 is an enlarged partial sectional view taken along the line II-II of the article shown in Figure 1.

Figure 3 is an enlarged partial sectional view similar to that of Figure 2, showing another embodiment of the present invention.

Figure 4 is an enlarged partial sectional view similar to that of Figure 2, showing another embodiment of the present invention.

Figure 5 shows a sectional view taken through an end section of the decorative layer protected by a cover member.

Figure 6 shows an enlarged partial sectional view similar to that of Figure 2 including a scratch or flaw.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the present invention will be described in detail with reference to the drawings.

Figure 1 shows a tubular fishing rod body 10 as an example of an article according to the present invention. An exterior layer 12 of the tubular body 10 is formed by winding a fiber-reinforced prepreg having carbon fibers or the like as reinforcing fibers. An insulating synthetic resin coating layer 14 is formed on top of the exterior layer 12 by immersion in a synthetic resin, e.g. epoxy resin.

Although it is preferable that the material for the synthetic resin coating layer 14 be identical with the synthetic resin material used in the exterior layer 12, thereby improving the bond between each other, the materials need not be identical. The surface of the coating layer 14 is substantially smooth, like the surface of a mirror, with minimal surface roughness. A light metal, prefer-

ably aluminum or titanium, is vapor-deposited on the coating layer 14 by physical vapor deposition (PVD). PVD techniques such as vacuum deposition, sputtering and ion plating are used to form a thin metal, decorative layer 16. The decorative layer 16 preferably has a thickness of several microns or less. Since the surface of the synthetic resin coating layer 14, which forms the substrate for the PVD, is substantially smooth like a surface of a mirror, the decorative layer 16 is also substantially smooth. Consequently, consistency of the surface aesthetics is improved.

Since the insulating synthetic resin coating layer 14 is interposed between the exterior layer 12 and the metal decorative layer 16, it is possible to prevent erosion between these layers. Further, the bond between the substrate and the above-mentioned physical vapor deposition is improved to eliminate separation and minimize cracking of the metal decorative layer 16. Further, since a PVD layer can be formed which is less than about 1 micron thick, a fishing rod or other article can be made light in weight and cracking as a consequence of bending can be virtually eliminated.

A transparent or semi-transparent layer 18 may be formed on top of the decorative layer 16 to provide protection. As such, the protective layer 18 is generally thicker than the synthetic resin coating layer 14 or the metal decorative layer 16. The transparent or semi-transparent layer 18 may be colored with a dye, and in combination with the sheen of the metal decorative layer 16, give a deep and rich appearance to the tubular body 10. Further, the protective layer 18 may also be a mat clear layer, a clear layer of paint including beads, a clear layer having a fluorescent color, or a clear layer of paint mixed with particles for preventing stains, odors, adhesion of bacteria, or the like.

In addition, although it is not specifically shown in the drawings, the protective layer 18 may also cover the longitudinal ends of metal decorative layer 16 at the tip and butt ends of the rod body 10. In a structure as shown in Figure 1, if the synthetic resin coating layer 14 has the same or similar color as that of the metal decorative layer 16, a scratch or flaw which may occur on the metal decorative layer 16 when the rod body 10 is accidentally hit on the rock or the like, is inconspicuous.

Also the rod body 10 may have a structure for preventing the exposure of the metal decorative layer 16. As illustrated in Figure 4, the protective layer 18 may also extend over the longitudinal ends of the metal decorative layer 16 at the tip and butt ends of the rod body 10 to prevent the longitudinal ends of the metal decorative layer 16 from being exposed outside. Alternatively, a cap member may be securely adhered to each of the tip

and butt ends to prevent the exposure of each of the longitudinal ends of the metal decorative layer 16, as illustrated in Figure 5.

In a case where a scratch or flaw passes through the protective layer 18, the metal decorative layer 16, being relatively thin, is easily damaged so that the scratch also passes through the metal decorative layer 16 as shown in Figure 6. In such case, if the viewable lower layer, i.e. the synthetic resin coating layer 14 below the metal layer 16, has the same or similar color as that of the metal layer 16, the scratch is not likely to be conspicuous.

Figure 3 shows another embodiment of the present invention, and illustrates an enlarged section of an alternate embodiment according to the present invention. In the same manner as the embodiment shown in Figure 2, an insulating synthetic resin coating layer 14 is formed on the exterior of a tubular body layer 12. A synthetic resin coating layer 14 and a thin metal decorative layer 16 are subsequently formed on top of the tubular body layer 12. In this embodiment, an above-mentioned transparent or semi-transparent color clear layer, a fluorescent color clear layer or the like 20 is formed on top of the metal decorative layer 16, and a transparent or semi-transparent protective layer 18 which is generally thicker than any other layer is formed on top of the layer 20. In this manner, a plurality of protective layers may be formed. Alternatively, a high durability, thin coating may be formed with, for example, an ultraviolet setting paint. Thus, it is possible to provide an article 10 with a deep, bright and aesthetically pleasing appearance. In this case, the protective layer 18 may be omitted, in which case the color clear layer 20 acts as the protective layer.

The color clear layer, or the like 20, need not be formed over the entire surface of the article 10, but may be formed partially. For example, the layer 20 may be applied in different patterns so as to provide decoration with variety. It is also envisioned that the metal decorative layer 16 may be formed partially on the surface of the base rod 10 such as by partially covering the base rod 10 with a suitable member, or by any other method. Further, a structure in which cloth or the like is to be wound on a grip portion of the article 10 is also within the scope of the present invention.

Further, as mentioned above, the present invention can also be applied to any number of fishing goods including rods, reels, lures, tackle boxes, as well as boats and other supplies; shafts and heads of golf clubs; tennis rackets; badminton rackets; bicycle frames; or the like. The articles 10 may also be constructed from materials other than fiber-reinforced synthetic resin material, including metal materials including alloys such as an alu-

minum alloy and magnesium alloy as well as non-reinforced synthetic resin materials. In the case of a synthetic resin material, it is preferable that the surface is formed so as to be substantially smooth, like a mirror surface, before the metal-deposition decorative layer is formed thereon. However, in order to improve the adhesion of the deposition metal to an article body, a synthetic resin coating layer having a surface formed to be substantially smooth may be formed of any kind of synthetic resin other than that of the article body.

According to the present invention, since an insulating synthetic resin coating layer is formed between an article body and a metal decorative layer, it is possible to prevent erosion even if the article body or a surface portion thereof consists of materials causing electric erosion with metal. In the case of physical vapor deposition, not only the bond with a substrate is superior, but also separation and cracking of the metal decorative layer are virtually eliminated. Further, since a deposition layer formed by physical vapor deposition can be made exceptionally thin, an article such as a fishing rod or the like can be made light in weight. At the same time, cracking is minimized even if transformation such as bending occurs. Due to the existence of a protective layer, the thin metal decorative layer is protected for the sake of increased durability and to maintain the aesthetic qualities of the decoration for a long time. In addition, since the surface of the synthetic resin coating layer, which is the substrate surface on which deposition occurs, is formed so as to be substantially smooth, the decorative layer is also formed to be smooth so that the aesthetic qualities are further improved. It is therefore possible to provide an article which has high strength to minimize any cracking or separation, is durable, is light in weight and is decorated to achieve an aesthetically pleasing appearance.

#### Claims

1. An article having an exterior surface, said article comprising:  
a synthetic resin coating layer having a substantially smooth surface on top of the exterior surface;  
a relatively thin decorative layer on top of said synthetic resin coating layer; and,  
a protective layer on top of said decorative layer.
2. The article according to claim 1, wherein said decorative layer is formed through physical metal vapor deposition.
3. The article according to claim 2, wherein said physical metal vapor deposition includes vacu-

um deposition.

4. The article according to claim 2, wherein said physical metal vapor deposition includes sputtering.
5. The article according to claim 2, wherein said physical metal vapor deposition includes ion plating.
6. The article according to claim 1, wherein said protective layer is transparent.
7. The article according to claim 1, wherein said protective layer is semi-transparent.
8. The article according to claim 1, wherein said synthetic resin coating layer has the same color as that of said decorative layer.

Fig.1

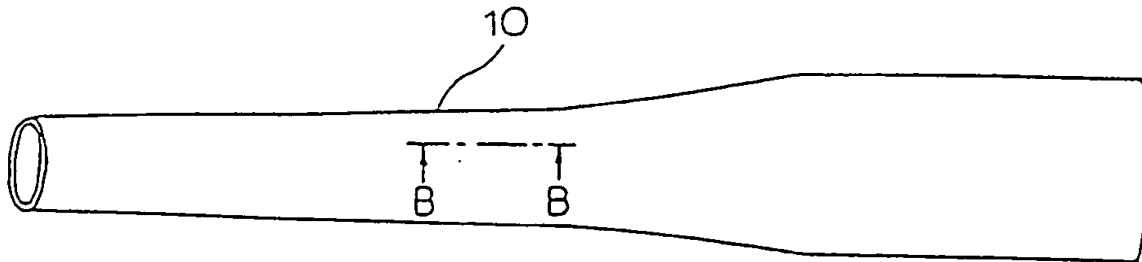


Fig.2

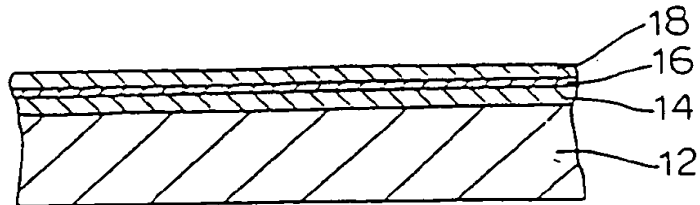


Fig.3

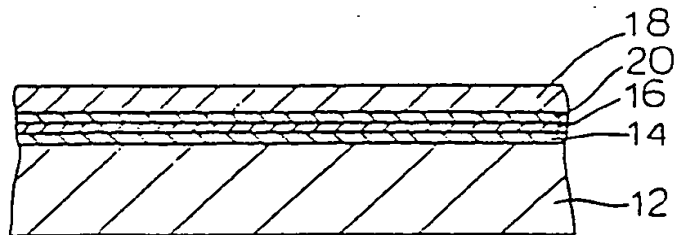


Fig.4

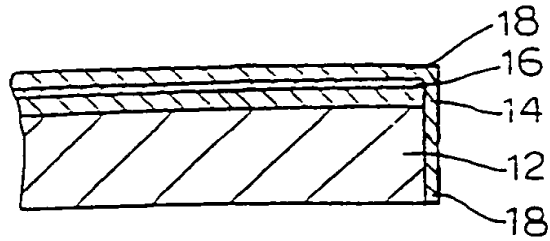


Fig.5

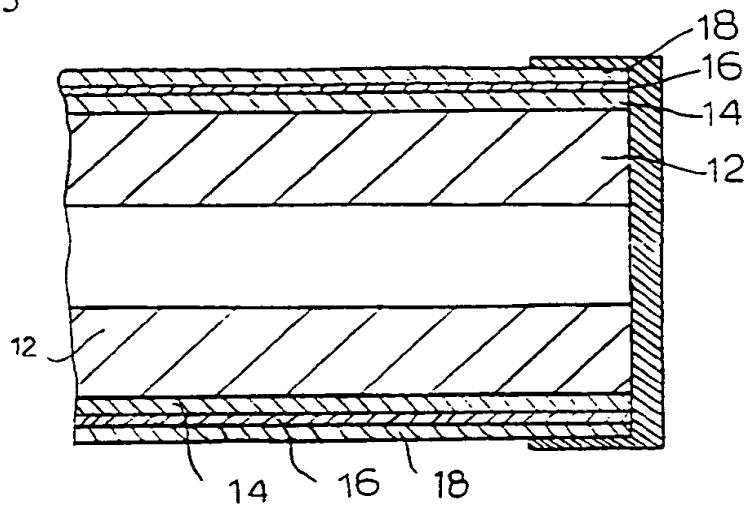
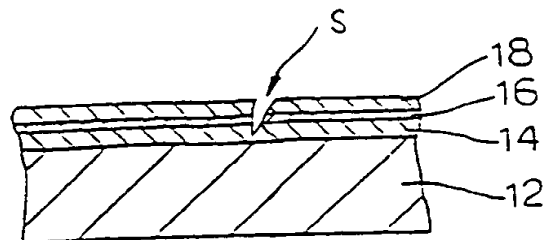


Fig.6





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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 11 1316

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-A-33 33 381 (TOYODA GOSEI KK ) 22 March 1984	1-6,8	C23C14/20 A01K87/00
A	* page 7, line 15 - line 26; claim 1 *	7	
X	PATENT ABSTRACTS OF JAPAN vol. 009, no. 171 (C-291) 16 July 1985 & JP-A-60 043 479 (MITSUBISHI JIDOSHA KOGYO KK) 8 March 1985 * abstract *	1-4,7	
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X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 395 (M-1299) 21 August 1992 & JP-A-04 131 232 (TOTSUKA SOUGIYOU:YUUGEN) 1 May 1992 * abstract *	1,2,4,6	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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A	US-A-5 028 464 (SHIGETOH HIDETOSHI) 2 July 1991 * example 1 *	1-8	
A	GB-A-1 094 785 (ICI LTD) * page 2, line 16 - line 55 *	1-8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 October 1994	Examiner Ekhult, H
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document	

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